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USSR Report

ENERGY

(FOUO 19/81)

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ELECTRIC POWER

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THERMOELECTRIC POWER STATION CONSTRUCTION PROBLEMS AT KANSK-ACHINSK COMPLEX

Moscow ELEKTRICHESKIYE STANTSII in Russian No 6, Jun 81 pp 2-8

[Article by V. N. Okhotin and A. A. Titov, Teploelektroproyekt engineers]

[Text] A characteristic feature of the present-day stage of development of the domestic thermal-power industry is the transition to a new level of unit outputs for generating sets and for power stations. The 500-MW units fired by Ekibastuz coal and introduced in the 9th and 10th Five-Year Plans (Troitskaya and Reftinskaya GRES's) and the 800-MW fuel-oil units (Zaporozhskaya and Uglegorskaya GRES's) have been mastered and the first 500-MW power units have been introduced at the Ekibastuz GRES-1. Finally, a unique 1,200-MW power unit has been put into experimental-production operation at the Kostromskaya GRES. Installed capacities of 3 million kW and greater have been achieved by the Krivorozhskaya GRES-2 and the Zaporozhskaya, Uglegorskaya, Reftinskaya and Kostromskaya GRES's.

The development of the Soviet thermal-power industry at the present time is a component of the strategy intended to solve the fuel and power problem of CEMA member nations in the period to 1990. This strategy, agreed to by the 22nd CEMA Session (1978), is directed at the maximum involvement of solid fuels in the production of electric power and the maximum utilization of power-production facilities in the economic turn-around [1]. A most important position in this strategy is occupied by the construction of the Kansko-Achinsk Fuel and Power Complex (KATEK), begun during the 10th Five-Year Plan.

In view of the certain complexity of this issue, this article examines only some of the problems relating to the design of the KATEK power stations which the Teploelektroproyekt Institute--the general designer of the power-production portion of KATEK and the Ekibastuz fuel and power complex--has encountered [2].

The requirement for the construction of the KATEK is dictated primarily by the proven reserves of Kansko-Achinsk coal, comprising almost one-seventh of the country's known reserves, and by the geographically advantageous location of these reserves comparatively near to the consumers and in the immediate vicinity of the Trans-Siberian railway. It is likewise dictated by the deposit conditions of the Kansko-Achinsk coal which make it possible to strip-mine the coal with a mining cost one to three times lower than the cost of Kuznets coal, four times lower than Karaganda, eight times lower than Donets and fourteen times cheaper than Pechora coal [3] with sufficient quality of the Kansko-Achinsk coal.

To this it must be added that serious factors have appeared at present which require that measures be taken to hasten the construction of the KATEK. The most important of these are the growing demand for electric power for the rapidly developing Siberian economy and the requirement for an optimized regional structure of generating capacities. Historically, this structure has been poorly established as a result of the one-sided development of hydraulic engineering and a reduction in the construction of thermal condensing electric power stations. This introduced an element of unreliability into the electric-power supply to the Siberian region, particularly in low-water years.

Out of the many alternative methods for incorporating the reserves of the Kansko-Achinsk Basin (KAB) in the economy, the one recognized as the most suitable is the construction of the KATEK in two industrial centers--North and South--with a combined output from their electric-power stations of 80-100 million kW and the power-industry processing of Kansko-Achinsk coal in an effort to utilize more efficiently the products of this processing.

It has been proposed that the development of the KATEK be accomplished in two stages. In the first stage to 1990-1995, designs suggest the construction of four or five stations in the southern industrial center with individual outputs of 6.4 million kW and a plant for the repair of power-production equipment (ZREO) in the complex; the creation of a new high-output power-supply network; the development of western coal deposits (Berezovskoye, Uryupskoye and Itatskoye); the construction of complex facilities for housing and utilities and mass cultural purposes, etc. At this stage, plans have also been made to undertake a number of measures of a scientific-research nature as well as to develop central heating in Western Siberia on the basis of the KAB.

At the second stage (after 1990-1995), proposals have been made for the development of power-engineering reprocessing of Kansko-Achinsk coal and the construction of new, large-scale TES's in the KAB and Western Siberia on the basis of experience acquired during the first stage.

It has been suggested that the KATEK be constructed at a rapid pace, for which plans have been made for the construction of a powerful construction and installation base.

A powerful impetus to the utilization of Kansko-Achinsk coal was provided by the resolution of the 25th CPSU Congress: "Expand the work being done to accelerate the creation of the Kansko-Achinsk Fuel and Power Complex." As a result of a detailed examination of the designs, the stage-by-stage construction of KATEK facilities has been established.

It has been established, in particular, that construction be begun on the top-priority facilities comprising the southern industrial center: the Berezovskaya GRES-1 with its total output of 6.4 million kW (8 x 800 MW); the first three 800-MW generating units of the Berezovskaya GRES-2; a plant for the repair of power-production equipment for electric-power stations and open-pit coal mines; and 220 to 1,150-kV electric transmission lines.

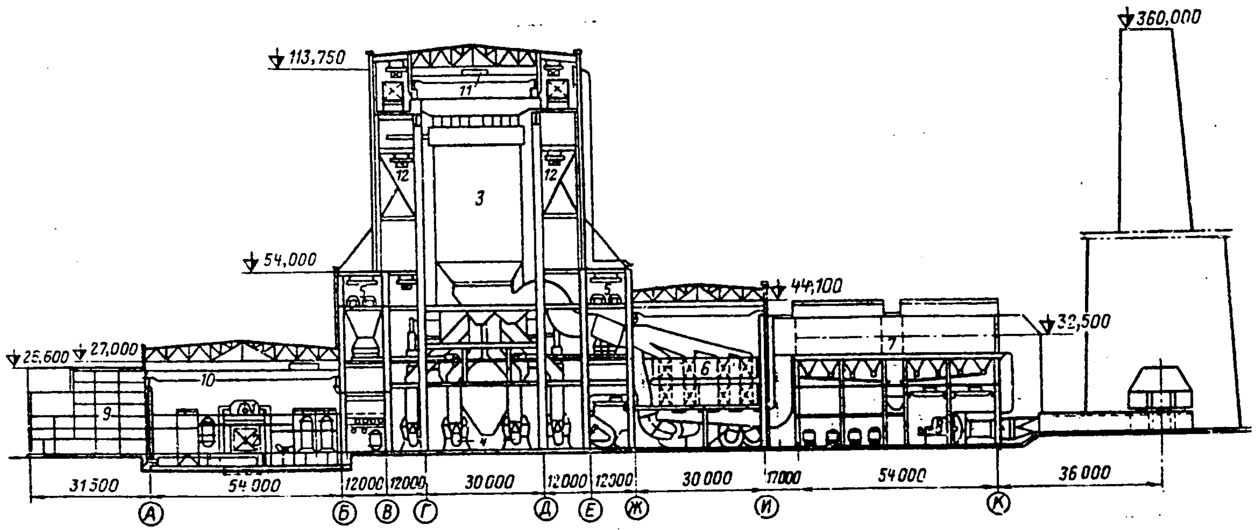

Fig. 1. Berezovskaya GRES-1. Cross-Section of the Main Building

1. Turbine unit
2. Condenser
3. Boiler unit
4. Grinding fans
5. Coal-delivery conveyer
6. Tubular air heater
7. Electric filters
8. Exhaust fans
9. Modular control panel
10, 11. Overhead crane with corresponding capacity of 120/20 and 10 t
12. Overhead crane with rotating beam of 10-t capacity

The geological mining conditions in combination with the known balanced reserves of coal provide the grounds to expect the conversion of the KAB into one of this country's most significant fuel and power bases.

Provisions have likewise been made for prospecting for new sources of drinking-water and process-water supplies and for nonmetalliferous raw materials. Provisions have also been made for the construction and expansion of a number of other facilities, including new roads, plants for the repair of strip-mining and transportation equipment and the production of hoisting-and-conveying equipment, etc.

In order to accelerate the construction of KATEK installations, provisions have been made for the construction of a powerful construction and installation base. In particular, this includes the construction of power-industry facilities using a high-speed industrial production-line method: a regional industrial procurement base (RPKB), which is a complex of enterprises and production boards for the operation and maintenance of construction machines and transportation equipment, for material and technical supply and for the manufacture, procurement and assembly of construction elements and equipment.

Emphasizing the attention that the party and the government devote to these issues, at the conference of power engineers and workers in the power-industry and power-machine construction enterprises and institutes dealing with the development of the power industry which took place on 2-3 June 1980 in the CPSU Central Committee, Comrade A. P. Kirilenko said: "One of the most important tasks for 1980 and subsequent years is the accelerated development of the work being done to create the Ekibastuz and Kansko-Achinsk fuel and power complexes. They have great significance for the entire economy, for the development of Siberia's and Kazakhstan's productive forces and for the supply of electric power to the country's central regions" [4]. This thought was continued in the "Basic Directions for the Economic and Social Development of the USSR for 1981-1985 and for the Period to 1990."

In developing the designs for all the installations in the complex's power-production section, the institute proceeded from the most important principles for the development of our country's economy; in particular, the principle of intensification and acceleration of central heating. This in turn required new engineering solutions, the most important of which is the standardization of the designs of all the electric-power stations. The first work was carried out on the basis of the detail design for the first KATEK station--the Berezovskaya GRES-1 (fig. 1).

As a result of the standardization of the primary and auxiliary equipment and the configuration, a standardized detail design was developed for the first KATEK GRES's. This design provided for the installation of eight 800-MW power units at each GRES in a standard-type main building. This building is an eight-bay structure, 264.5 m in total length (based on the addition of a modular control panel). This includes a 54-m machine room, a 12-m hopper-type deaerator, a 54-m (12 + 30 + 12) boiler room, a 12-m hopper compartment, a 30-m regenerating air-heater chamber and a 54-m electric-filter room. The modular control-panel chambers (each composed of two modules) are accessible from the "A" level. The overall length of the main building is 696 m.

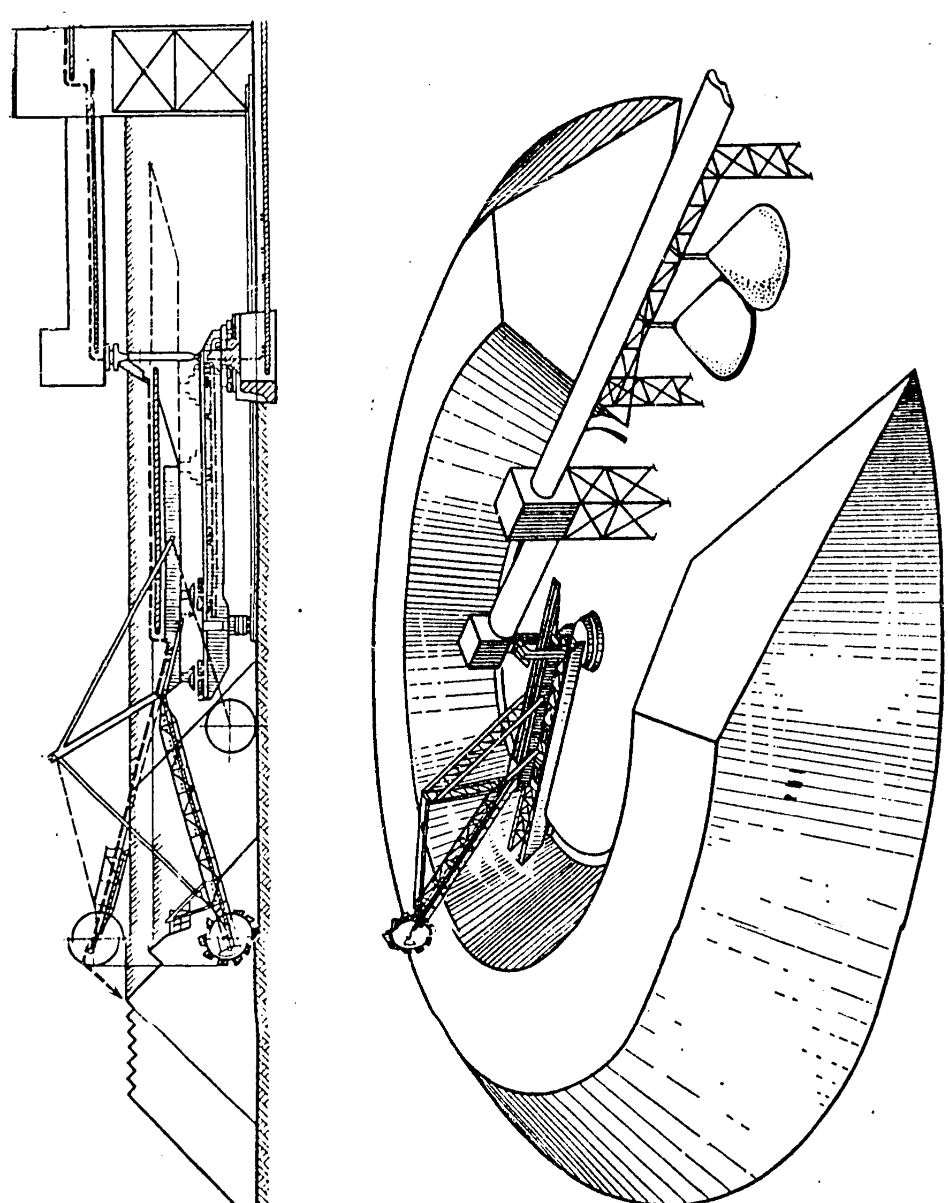

Fig. 2. Mechanization of Coal Storage at Berezovskaya GRES-1

In addition to the eight 72-m standardized modular cells, provisions have been made for two free bays to be situated in each of the following locations: at the permanent and temporary ends and between the fourth and fifth modules. Repair areas as well as equipment used throughout the station are situated in these free bays. In adition, there is one bay in the machine room of each modular cell used for repair needs.

The thermal system of the GRES is purely modular without connections across the main flows of steam and water.

Mechanization of the coal storage has been adopted using continuously operating machinery as was done at the Ekibastuz GRES-1 (fig. 2). This made it possible to increase considerably the productivity and to improve working conditions and the reliability of the fuel supply.

One of the serious problems which had to be faced during the design of the KATEK electric-power stations was the problem of transporting the Kansko-Achinsk coal from the open-pit to the GRES. The considerable drawbacks of the Kansko-Achinsk coal are its tendency toward rapid disintegration and spontaneous combustion. Losing its moisture quickly in air, the coal disintegrates above 0° and turns to powder. Below 0°, however, it freezes. Berezovskiy coal belongs to the class of coal having the greatest explosion hazard.

The proximity of the power stations to the coal mines (10-15 km) also had a great influence on the solution to this problem. A number of alternatives for transporting the coal were examined during the design process: large-capacity cars on an individual coal-hauling rail line, conveyer belts, large-capacity vehicles and a pneumatic method. As a result of studies done on these methods, the conveyer method was adopted on the recommendation of the USSR Ministry of the Coal Industry. Two conveyers 1,800 mm wide with a capacity of 5,250 m^3/h each and a speed of 2.5 m/s will be employed. Specific designs for the conveyer method are being developed at present.

As is well known, foreign practice provides examples of similar designs. In the United States, in particular, a belt conveyer 5.4 km long (belt width 1,370 mm, speed 4.5 m/s) with a capacity of 3,700 t/h has been in operation since 1976. The same type of conveyer more than 80 km long is being designed.

According to the authors' opinion, only the closed-conveyer version can be adapted from the specific designs examined for the KATEK. Considering the characteristics of Kansko-Achinsk coal noted, the application of the open conveyer in the geographic zone of the KATEK will lead to an acute reduction in the operational reliability of electric power stations due to systematic interruptions in the supply of fuel.

Another serious problem was the selection of a pulverization system and the corresponding grinding equipment. The characteristics of the KATEK dictated an arrangement for direct injection of the fuel into the combustion chamber using grinding fans. At the time the Berezovskaya GRES-1 was being designed, however, our domestic industry had not yet manufactured grinding fans of the required capacity for 800-mW units. Positive results obtained from the testing of a prototype M-V 3300/800/490 unit was of inestimable value. This unit with a capacity of 62 to 63 t/h of Bulgarian lignite (W^r = 50.6 to 55.6 percent, A^s = 27 to 45 percent, K_{10} = 1.1) demonstrated the basic soundness of the design selection.

According to data from the TsKTI [Central Scientific Research, Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov], an output level of 70 t/h was achieved during a short-term test grind in the same grind fan using Berezovskiy coal (W^r = 33.5 percent, A^s = 16 percent). In this test, $R_{90} \approx 48$ percent, $R_{1000} \approx 1.7$ percent, the gas consumption was 195,000 m^3/h, the developed head was 150-155 kgs/cm^2 and the specific consumption of energy was 7.5 kW · h/t. With the same head and a rate of gas consumption of 175,000 m^3/h, the output level was 80-82 t/h [5]. In this manner, the validity of the method selected is basically confirmed. For a conclusive solution to this problem, however, these grinding fans must be operated at the Berzovskaya GRES-1.

A most vital problem determining the specific design features of the GRES was the selection of the design of the boiler unit. In addition to the Teploelektroproyekt Institute and its Rostov and Tomsk sections, the TsKTI, the All-Union Institute of Heat Engineering imeni F. E. Dzerzhinskiy, the Podol'sk Machinery Plant imeni Ordzhonikidze, the Special Design Office for Electromechanical Production of the All-Union Institute of Heat Engineeling imeni F. E. Dzerzhinskiy and other interested organizations took part in resolving this problem. The difficulties in this problem were dictated by requirements to standardize the boiler for all GRES's in the southern industrial center. These GRES's are designed to burn coals from different mine sites with characteristics that vary appreciably (see table). These coals also have the specific properties of the mineral portion of Kansko-Achinsk coal (a tendency toward intense slagging, infusibility of the ash, etc.). Moreover, for example, it has been found that in a section of the future No. 1 Berezovskiy mine, the bulk of dense, unoxidized coal is interbedded with oxidized (sooty) coal. This coal differs noticeably from the bulk of Kansko-Achinsk coal because of its elevated moisture content (38 to 48 percent), the ash content (20 percent, on the average), sulfur content (up to 1.0 percent), irregularity in the organic mass make-up and a reduced heat of combustion (to 1810 kCal/kg [5].

It is also believed that the quality of the coal will change noticeably after some time (after the transition from selective bulk mining).

Furthermore, difficulties specified are caused by the lack of experience in burning Kansko-Achinsk coal in high-output boilers.

Based on this, a single-unit, suspended, gas-tight, T-shaped boiler unit with an output of 2,650 t/h and parameters of 255 kgs/cm^2 and 545/545° C was designed for the KATEK GRES's. It burns Kansko-Achinsk coal at low temperatures with reduced thermal stress in cross-section and volume of a square (in layout) combustion chamber with a tangential arrangement for the burner location and a relatively low exit-gas temperature (990° C). Provisions have been made for drying the fuel using exhaust gases at temperatures of up to 800° C. The total recirculation of the gases is up to 25 to 30 percent, and slag removal is dry.

These designs set very large dimensions for the boiler unit and the boiler room: the dimensions of the combustion chamber in the plan are 23.08 x 23.08 m, the

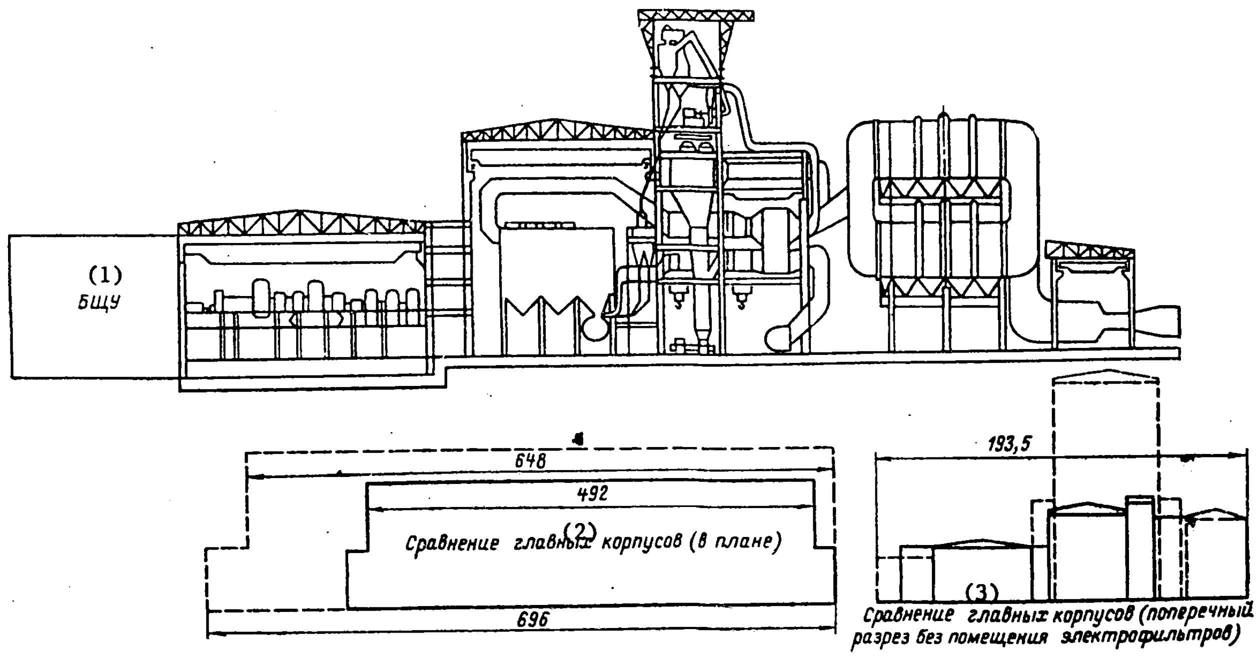

Fig. 3. Main Building of an Analogous GRES with 800-MW Power Units Equipped With Small-Scale Swirl-Type Boilers Compared to Designs for the Berezovskaya GRES-1

1. Modular control panel
2. Comparison of main buildings (floor plan)
3. Comparison of main buildings (cross-section without electric-filter compartments)

height of the chamber ceiling is 94 m and the height of the boiler room is 122 m. Such dimensions contributed to insuring the necessary operational characteristics of the boiler, η_k^{br} = 92 percent, as well as the conditions for "suppressing" nitric oxides. This is of great importance when such great boiler capacities are concentrated in such a limited area. The dimensions of the main building of the GRES, however, proved to be greater than those for GRES's built during the Ninth Five-Year Plan. A number of new, serious problems arose during the manufacture, installation, operation and repair of the boiler, as well as during the construction of the power station's main building. The most important of these is the suspension of the boiler on unique center beams 3.7 m high, covering a span of 33 m.

The solution to these new problems for the first-priority KATEK GRES's was reflected in the design features of the Berezovskaya GRES-1. We plan to elucidate these problems in a special article in the near future. However, the fact that the boiler unit selected caused complicated problems demonstrated the ambiguity of such a selection. Therefore, work continues on the development of a more modern boiler for 800-MW units fired by Kansko-Achinsk coal. In particular, in the interest of creating a small-scale boiler which would make it possible to improve considerably the characteristics of the main building (fig. 3): the specific volume would be reduced from 0.871 to 0.374 m^3/kW; the specific structure area from 0.012 to 0.009 m^2/kW; and the cost from 103.6 to 83.1 rubles/kW.

A Teploelektroproyekt Institute design for a similar 6,400-MW GRES with 800-MW units fired by Kansko-Achinsk coal shows that the utilization of a small-scale boiler as well as the introduction of other progressive designs (a deaeratorless thermal circuit, a unifilar high-pressure heater, a new layout for the unit with a reduced compartment, etc.) will make it possible to improve the technical and economic indicators for construction in comparison with indicators for the Berezovskaya GRES-1, including a reduction in the total cost of the main building of not less than 20 percent as well as an increase of approximately 1.5 percent in the unit's economy of operation while achieving an effective reduction in the nitric oxide content of the exhaust gases (fig. 4).

The practical application of small-scale boilers, however, is possible only after a serious check of all modifications for operation on Kansko-Achinsk coal, including the modernized boiler vessel for the 500-MW unit at the Nazarovskaya GRES and the experimental-production boiler with a swirl-type furnace and a capacity of 500 t/h at the Novosibirskaya TETs-3 (planned for introduction in 1981). This application of small-scale boilers cannot be accomplished until we obtain the results of research done at the experimental base of the All-Union Institute of Heat Engineering imeni F. E. Dzerzhinskiy (Krasnoyarskaya TETs-2), etc.

The search for optimal designs in these areas is being conducted jointly by interested organizations of the USSR Minenergo and Minenergomash, including Teploelektroproyekt, Soyuztekhenergo, the All-Union Institute of Heat Engineering imeni F. E. Dzerzhinskiy, the Central Scientific Reasearch, Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov and boiler-construction plants.

Serious difficulties in the construction of KATEK electric-power stations and, in particular, in the design of hydraulic structures were caused by the fact that,

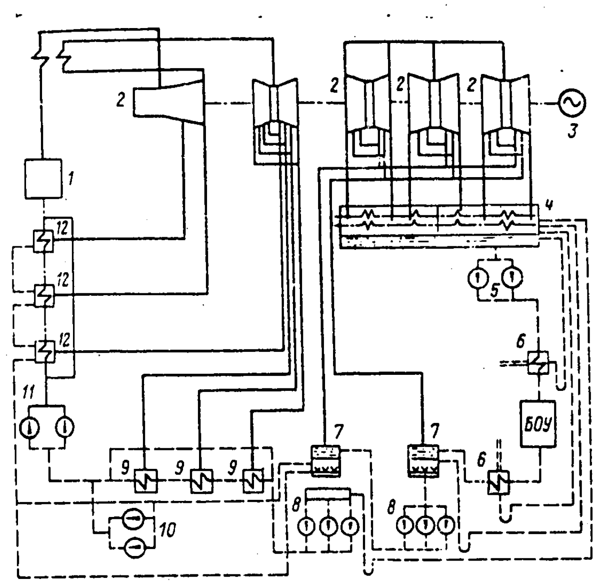

Fig. 4. Deaeratorless Layout of the 800-MW Power Unit at the Berezovskaya GRES-1

1. Steam-generator, D_p = 2,650 t/h
2. K-800-240 turbine
3. TVV-800 generator
4. Condenser
5. First-stage condensate pump
6. Sealed heaters
7. No. 1 and 2 (mixing) low-pressure heaters
8. Second-stage condensate pump
9. No. 3, 4, 5 low-pressure heaters (surface)
10. Overflow pumps
11. Supply pumps
12. High-pressure heaters

Solid line--analogous GRES with small-scale steam generator

Broken line--Berezovskaya GRES with P-67 steam generator

on the one hand, the construction zone for these stations has an insufficient supply of water reserves and, on the other hand, has conditions favorable for the formation of fog. The installation of water-cooling towers at GRES's under these conditions would contribute to the contact of moisture from the water-cooling tower with exhaust gases from the GRES smokestacks and, as a consequence, to the formation of fog carrying harmful aerosols and the dispersion of these over an area of dozens of square kilometers. Moreover, the region does not have surface water sources for a drinking-water supply.

For these reasons, a reverse system of process-water supply with cooling reservoirs on the Beresh and Chulym rivers was adopted for the first GRES's. This will make it possible to limit the possibility of fog formation brought about by conditions of a local nature. Provisions have been made for a maximum return (after neutralization and purification) of industrial and domestic water flows for subsequent utilization in the GRES's production cycle. The feasibility of installing air ("dry") water-cooling towers is being studied for the GRES-4. Provisions have been made for burning oil and fuel-oil residues in the boiler furnaces.

A system for domestic water supply will be implemented in the first stage using artesian wells. Pertinent studies are under way to resolve definitely the problem of the drinking-water supply.

The issue of the ecology proved to be a serious problem for the GRES design. The solution to this problem takes the form of the study of the most important scientific and technical problems which, at times, would seem to have nothing in common with the development of thermal-power engineering. In order to understand this, we must turn our attention to one geographic feature of the KATEK, using the example of the southern industrial zone. At a radius of up to 27 km from the city of Sharypovo, now under construction and planned for a population that will exceed 250,000, 4-5 unique pulverized coal GRES's, each with an output of 6.4 million kW, are being built. Also under construction are: a plant with high-capacity foundry facilities for the repair of power equipment; a plant for the repair of mining equipment, also with foundry facilities; large-scale construction-industry enterprises; open-pit mining enterprises with a yearly capacity of 100-110 million tons of Kansko-Achinsk coal; high-capacity enterprises for the power-engineering reprocessing of raw coal and still others. If scientifically grounded measures are not taken, such a concentration of industrial sites under construction is capable not only of destroying the existing ecological balance in a given limited area, but also of causing irreversible shifts in the entire region. For this reason, the designers make provisions for measures to protect the environment both for the period of construction of all the installations, including GRES's, as well as for the period of their normal operation, in particular:

protection of land resources and, first of all, agricultural lands--a minimum of earth removal for installations under construction with total compensation of lost land through special land-restorative operations; recultivation of temporarily destroyed (during the construction period) lands (the removal, stockpiling, storage and subsequent restoration of the topsoil layer); the development of bush regions; special measures which make it possible to discontinue the conservation of mineral resources; measures to prevent the pollution of land and ground water, etc.;

protection of the air basin in the area of the KATEK--in particular, the GRES design provides for the construction of smokestacks up to 420 m in height; the installation of UG-3 electric filters with an efficiency of up to 99.5 percent; measures taken to prevent dusting of the ash dump as well as measures to "suppress" nitric oxides and combat sulfur oxides during combustion of the coal in the boiler furnace;

protection of the air basin from chemical and thermal pollution and measures to restore the biological environment of the reservoirs--the construction of "drainless" process-water circuits for GRES's; the location of ash and slag dumps based on the hydrogeological situation with the organization of antidrainage measures to prevent the pollution of the ground water; the construction of plants to breed whitefish, sturgeon and other small fish; the establishment of rest zones for the workers, including the construction of water-sport and spa facilities, etc.;

utilization of secondary resources--low-temperature sources for hot-houses and fish hatcheries; ash and slag wastes for construction (a reduction in ash and slag in the hydraulic ash-removal system increases the operational reliability of the ash pipeline and, consequently, of the GRES itself, since the ash, which has self-cementing properties, will not be hydraulically tranported as far);

creation of a continuously operating fully automatic service for observing and controlling the level of pollution of the environment by each facility in the complex (RSK KATEK [expansion not provided]) with a central regional organ--the Sharypovskaya hydrometeorological observatory.

Under the guidance of the Institute of Applied Geophysics (IPG), the scientific research organizations of the USSR Geological Committee for Hydrometeorology and Control of the Environment have completed the first stage of the on-going investigation into the question of the KATEK's effect on the environment. This stage confirmed the correctness of the nature-protecting design measures for the southern industrial zone. In a new stage of this research, the program of works and the composition of the participants (the Siberian Branch of the USSR Academy of Sciences and the Siberian and Far-Eastern organizations of the USSR geographic society, etc.). Plans have been made for the study of the topographic-geochemical situation, changes in the hydroclimatic factors, economic-ecological issues, medical and biological aspects, etc.

Particularly worthy of study are the problems of the power-engineering reprocessing of Kansko-Achinsk coal and the effect of these problems on the structure, profile and design of future GRES's. In particular, although for the first KATEK GRES's a classical arrangement for the combustion of ordinary Kansko-Achinsk coal was adopted, development is underway of a GRES variant operating on the products of the power-engineering reprocessing of Kansko-Achinsk coal. In this case, provisions have been made for various alternative methods of maintaining the production links between the power-engineering installation (ETU) and the GRES: the ETU at the strip-mine with the delivery of the reprocessing products to the GRES sites, etc. It would be advisable to examine this problem separately and in detail.

At the present time, the study of this problem for the KATEK has not been concluded entirely. A definitive solution can be adopted only after testing of the experimental units using the layout of the Power Engineering Institute imeni G. M. Krzhizhanovskiy at the Krasnoyarsk TETs-2 (ETKh-175) and a layout for the heat processing of Kansko-Achinsk coal using a thermal-contact method for coking the coal [6].

At today's level of knowledge about this problem one can speak of the unsuitability of uniting energy technology with the GRES's (that is, refraining from burning ordinary Kansko-Achinsk coal) within the confines of the Kansko-Achinsk basin. If further studies make it possible to disprove this belief, it will pose the question of the new industrial-technical conglomeration of the ETU and the GRES, the nature of which is difficult to determine at the present time.

Deposit	Q^r_n, kCal/kg	W^g, %	A^s_{av}, %	V^r, %	S^s_{tot}, %	t_1, °C	t_2, °C	t_3, °C
Berezovskoye	3740	33	4-7	48	0.3	1270	1290	1310
Itatskoye	3060	40.5	11.5	48	0.7	1200	1220	1240
Irsha-Borodinskoye	3740	33	9	47	0.3	1180	1210	1230
Barandatskoye	3540	37	7	48	0.3	1300	1320	1340
Bogotol'skoye	2820	44	12	48	0.9	1150	1170	1190
Abanskoye	3520	33.5	12	48	0.5	1140	1160	1180
Uryupskoye	3740	33	7	48	0.3	1270	1290	1310

Note: For coal from the Irsha-Borodinskoye deposit W^r_{max} = 36 %, A^s_{max} = 20-28 %; for coal from the Berezovskoye deposit A^s_{max} = 4-7%.

A serious problem which will exert an influence upon the quality of operation of future GRES's as well as upon the number of inhabitants of the city of Sharypovo and other matters is the determination of the organizational structure of industrial management and the establishment of a system of operational-repair service for the electric-power stations. This being the case, we must first of all keep in mind that the primary reason for the appearance of this problem is the creation from scratch of a new, mighty power system with a great many industrial and production personnel in this little-developed region. The seriousness of this problem lies not only in the difficulties of the demographic plan but also in the unique nature and novelty of the installations constructed and their equipment, which must be serviced by these personnel. It also lies in the unprecedented (in physical quantities) consumption of production which can be expected.

For example, if one begins with the average specific repair expenditures for power units achieved today, the yearly outlay alone for the repair of the first four GRES's can exceed 100 million rubles. For this reason, beginning with the accumulated domestic and foreign experience, the Teploelektroproyekt Institute proposed a functional organizational structure for management of GRES's and power-equipment repair plants in the southern industrial zone headed up by a consolidated board of directors. It has been proposed that all the administrative and management functions as well as the planning and organization of industrial activity be centralized in the consolidated board using modern automatic control-system equipment. In this case, the GRES would be charged with the operational functions, while the tasks of maintenance and repair and the responsibility for the condition of the equipment (excluding matters associated with the activities of the operations personnel) would be entrusted to the power-equipment repair plant which performs total servicing for all the GRES's.

In accordance with the technical and economic substantiation of the KATEK, the Giproenergoremont specification envisions the power-equipment repair plant as part of the internal plant production and, so to speak, of the "out-of-house" sector which carries out repair operations at the GRES sites. The material base for the plant production proper provides for the accomplishment of industrial plant repair of all transportable equipment, including transformers and feed pumps, the manufacture of spare parts, fittings, accessories, etc., and has a foundry with a designed capacity of 30,000 tons of castings annually. For the year-round steady operation of the power-equipment repair plant with small-scale and regular batch production, provisions have been made for the centralization at the plant of spare parts, assemblies and parts for equipment and individual units in the form of an exchange stock supply. This stock supply, moreover, is the basis for the unit-assembly method of repair of all GRES equipment at its installation site using resources from the repair plant's "out-of-house" sector. The material base of the "out-of-house" sector is the training, preparatory, warehousing and other sections at the plant's working area as well as the sections at each GRES equipped on the basis of overall mechanization of all operations. It also includes the creation of normal industrial and public-and-domestic sanitation conditions and administrative-and-management activities.

As the "general repairman," the plant attracts the corresponding enterprises and organizations in order to carry out the specialized operations at the GRES. In the GRES designs, the same conditions are envisaged for these personnel as for personnel at the power-equipment repair plants.

The design repair system provides for reducing the specific repair expenditures for the first four GRES's in the southern industrial complex to 2.34 rubles/kW, that is, more than 50 percent below the level achieved for 800-MW gas and fuel-oil units in 1978.

Considerable difficulties in the realization of the design system of operational repair service are caused not so much by a lack of experience (elements of such a system were successfully introduced in a number of economic planning departments and RU's/possibly, rayon administration/ in particular, in Mosenergo) as by the presence of a certain "psychological barrier."

Not pausing to dwell on other problems because of limited space in this article, we must mention the difficulties not only in the development but also, to a greater degree, in the realization of designs to set up high-speed flow-type construction of the GRES complex on the basis of the regional industrial procurement base (RPKB), whose industrial capacity is determined considering the yearly introduction of two 800-MW power units and the assurance of 150 million rubles of construction and installation work for industrial buildings annually. For these conditions, owing to the bulkiness and great mass of the assembled units, it is necessary to expand considerably the volume of motor-vehicle transportation; to create new, specialized motor-vehicle equipment--special and modular trailers with a freight capacity of 30 to 200 t; and to build the corresponding road network. According to a preliminary estimate, the creation of a regional industrial procurement base and its introduction based on high-speed flow-line construction can increase the productivity of labor by not less than 8 to 10 percent, improve the quality of construction and installation operations and reduce capital investment.

In view of the facts presented, the first results from the construction of the Ekibastuz fuel and power complex (ETEK), the designs of which are similar to those used in the KATEK, present some interest. An analysis of these results provides a basis to believe that the shortcomings and delays that were caused can be explained to a certain degree by:

first of all, the lack of unified management for such a gigantic construction project, as a result of which there have appeared and continue to appear a number of problems brought about by bureaucratic dissociation--in particular, problems of personnel and housing;

secondly, the underestimation on the part of construction and installation organizations (unable to overcome the "psychological barrier" on the way to new designs) of the progressiveness and advantage of industrial methods incorporated in the designs for constructing electric-power stations. In Ekibastuz, in particular, construction has not been completed on the RPKB's envisaged in the designs nor have the roads been graded as necessary, etc. In other words, the material basis for industrial construction has not been created;

thirdly, the lack of unified management for the complex which would insure the harmonious development and strictly coordinated functioning of all units in the complex in both the production and nonproduction spheres.

The KATEK is a gigantic construction project for the national economy which will give new life to this little-developed region. It will not only transform this region but will turn it into one of the most important regions of the country.

The construction of the KATEK is not a task for a single year nor even a single five-year plan. This construction project, naturally, will cause a great many new, serious problems. We can say with assurance, however, that, while changing with respect to time, circumstances and the experience of the complex's builders, the problems of the interplay between nature and projects under construction will continue to be of urgent concern for many years to come. Also of current interest are the improvement of the production process, the introduction of new, more modern equipment for electric-power stations and the development of the economic activity of electric-power stations, including an operational repair service system for GRES's.

BIBLIOGRAPHY

1. Bogomolov, O., "The Fuel and Power Problem in CEMA Countries," PROBLEMY MIRA I SOTSIALIZMA, No. 8, 1980.

2. Okhotin, V. N. and Titov, A. A., "Designs for the Power-Production Sector of the Ekibastuz Fuel and Power Complex," ELEKTRICHESKIYE STANTSII, No. 11, 1979.

3. Novikov, P. N., Boyarshinov, S. N., Myslin, G. A. and Myuntser, G. G., "The Ekibastuz and Itat Fuel and Power Complexes," TRUDY TEPLOELEKTROPROYEKTA, No 5, 1967.

4. PRAVDA, 4 Jun 1980.

5. Komarov, N. F., Moiseyev, G. I., Petrosyan, R. A., et. al., "Kotel'nyye i turbinnyye ustanovki energoblokov moshchnost'yu 500 i 800 MBt. Sozdaniye i osvoyeniye" [Boiler and Turbine Installations for 500 and 800-MW Power Units. Construction and Familiarization], Moscow, Energiya, 1979.

6. Boyarshinov, S. N., Vshivkov, V. A., Goldayev, A. M., et. al., "Promising Methods for the Efficient Utilization of Coal From the Kansko-Achinsk Basin," ELEKTRICHESKIYE STANTSII, No 4, 1974.

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